Relationship of House Building Materials, Lighting and Occupational Density to the Incidence of Tuberculosis

Isma Yuniar[1*], Aswin Wahyono[2], Heri Purnomo[3]

[1]*Bachelor of Nursing, Muhammadiyah Gombong University, Indonesia*
[2]*Health Care Center of Banjarmangu, Banjarnegara, Indonesia*
[3]*Public Health Office of Banjarnegara, Indonesia*
Corresponding author's email: yuniarisma40@gmail.com

ABSTRACT
The World Health Organization (WHO) declares Tuberculosis (TB) as a very important and serious public health problem throughout the world and is a disease that causes a global because in most countries in the world pulmonary TB disease is uncontrolled, this is caused by the number of patients who are not successfully cured, as well as the main cause of death caused by infectious diseases. Environmental health includes all physical, chemical, and biological factors from outside the body from environmental health that has the potential to have a health effect. Home environmental factors (ventilation area, occupancy density, lighting intensity, floor type, house humidity, and temperature) become the risk of pulmonary tuberculosis. The objective of present study is knowing the relationship between home environmental factors (house building materials, lighting, residential density) on the incidence of tuberculosis. This research used a correlation analytic research method with a case-control approach, totalling 40 respondents. From the research results obtained the results, there was no significant relationship between house building materials and the incidence of pulmonary tuberculosis, there was a significant relationship between home lighting and the incidence of pulmonary tuberculosis, and There was no significant relationship between the density of housing and the incidence of pulmonary tuberculosis. Implication as a material for developing community nurse programs in screening people at risk for TB disease so that the tuberculosis control process can be maximized.

Keywords: *House Building Materials; Lighting; Occupational Density; Tuberculosis*

1. INTRODUCTION

Tuberculosis (TB) is still a public health problem in Indonesia and around the world, thus it has become one of the goals of sustainable health development (SDGs). Indonesia has the second greatest number of tuberculosis patients after India. This foster continued national tuberculosis control through intensification, acceleration, intensification, and program innovation [1]. According to the 2019 Global Tuberculosis Report released by WHO on 17 October 2019, the world is not on the right track to achieving the goal of the END TB Strategy for 2020, which is to reduce TB by 20 percent of the number of cases in 2015-2018. Tuberculosis remains the 10th leading cause of death in the world causing the death of around 1.3 million patients [2].

Tuberculosis is a worldwide health concern. Tuberculosis incidence and mortality have declined as a result of numerous management initiatives, but the disease is still expected to affect 9.6 million people and kill 1.2 million people in 2014. The countries having the highest tuberculosis patients are India, Indonesia, and China. Tuberculosis is declared by WHO to be a very important and serious public health problem throughout the world, as well as a disease that causes a global emergency (Global Emergency) because pulmonary tuberculosis disease is uncontrolled in most countries, owing to a large number of patients who cannot be cured, and as the leading cause of death caused by infectious diseases [3].

Environmental health encompasses any physical, chemical, and biological variables from outside the body that have the potential to affect health. Environmental and behavioral risk factors for tuberculosis transmission exist. Environmental risk factors include ventilation, housing density, temperature, illumination, and humidity. Meanwhile, behavioral factors include smoking, spitting or releasing mucus anywhere, coughing or sneezing without protecting your mouth, and

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failing to open windows [4]. Pulmonary TB disease is easily transmitted to those who live in crowded housing, lack sunlight, and have poor/stuffy air circulation, but if there is enough air and circulation, TB germs can only survive for 1-2 hours.

The Millennium Development Goals or MDGs targets for TB control are the prevalence of TB to decrease to 222 per 100,000 populations and the TB mortality rate to decrease to 46 per 100,000 [5].

Indonesia has a healthy home accomplishment rate of 68.69 percent. House features are variables that influence the spread of Tuberculosis disease, and residential density is the most important determinant in disease incidence [6]. Environmental and behavioral risk factors for tuberculosis transmission exist. Environmental risk factors include ventilation, housing density, temperature, illumination, and humidity. Meanwhile, risky behaviors include smoking, spitting or releasing mucus anywhere, coughing or sneezing without protecting your mouth, and not opening windows [4]. According to Dawile's research, there is a link between the occurrence of pulmonary tuberculosis and room occupancy density, bedroom temperature, natural lighting in the bedroom, and kind of home floor. According to Budi's (2018) research, occupancy density is the most important variable, with an OR value of 6.42. (1.55-26.63). House features are elements that influence the spread of tuberculosis, and residential density is the most important factor in the disease's occurrence [5]. To prevent tuberculosis, environmental risk factors in tuberculosis-prone areas must be monitored, along with counseling using a family approach.

Field observations made by health workers from the Banjarmangu 2 Community Health Centre found that the condition of the houses of the majority of people in Banjarmangu lives in areas adjacent to plantations, resulting in a lack of lighting in the house against direct sunlight. There are several houses with fences made of wood or not with walls. The area of the room is not proportional to the number and/or area of ventilation, as well as the density of the dwelling. Also, the habit of people who don't always open windows regularly. TB cases reported until December 2019 were 22 cases. Based on the background described above, the researchers are interested in researching “the relationship of house building materials, lighting, and residential density to the incidence of tuberculosis in the Banjarmangu 2 Health Centre Work Area of Banjarnegara."

2. METHOD

Correlational analysis with a case-control technique was used in this study. The study participants were split into two groups: the case group (the physical state of the dwelling impacted by tuberculosis) and the control group (the physical condition of the house that was not tuberculosis sufferers). In this study, the case population consisted of all pulmonary tuberculosis patients who were receiving treatment or had been infected with positive smear-positive pulmonary tuberculosis in the working region of the Banjarmangu 2 Health Centre throughout the 2019 period, a total of 20 respondents. In this study, the control population included all people who were not smear-positive pulmonary tuberculosis patients or who had not been infected with pulmonary tuberculosis in the working area of the Banjarmangu 2 Health Centre and did not live with pulmonary tuberculosis sufferers, a total of two respondents. In this study, bivariate analysis was used to investigate the link between the physical state of the house and the incidence of pulmonary tuberculosis (TB). The chi-square test and the odds ratio (OR) calculation were performed to determine whether or not there was a statistically significant link.

3. RESULT AND DISCUSSION

3.1. The relationship between house building materials and the incidence of pulmonary tuberculosis

The p-value shows that there is no relationship with the incidence of tuberculosis and the OR value shows that there are no risk factors (Table 1). The results of research conducted on 40 respondents found that there were 55% of respondents with house building materials that met the requirements. This shows that the majority of respondents have house-building materials that meet the requirements. The results of statistical tests obtained p-value = 0.111, so it can be concluded that there is no significant relationship between house building materials and the incidence of pulmonary tuberculosis. From the results of the analysis, the value of OR = 3.500 (CI = 0.945 - 12.966) means that the building materials of the house are not a risk factor for the incidence of pulmonary tuberculosis.

The results were following Dawile’s research who stated that there was no relationship between the type of house walls and the incidence of pulmonary tuberculosis in the Tobelo Health Centre Work Area [5]. In line with Asrijun's research, the results of the study showed that the total physical condition of the semi-permanent houses of cases and controls were the semi-permanent housing conditions that were less healthy, namely 71% while the physical condition of the healthy houses was 29%. In the physical condition of semi-permanent houses that are not healthy, all of them suffer from 100% of the respondents. The results of statistical tests obtained p-value<0.05 (p = 0.005), then there is a significant relationship between the physical condition of the semi-permanent house and the incidence of pulmonary TB in the working area of the Pattingalloang Health Center Makassar City, where the

physical condition of the semi-permanent house is not a risk factor with OR value = 0.000 [7].

In line with Rusmindarti's research house building materials. The results of this study did not follow Budi's research. Risk Factor Analysis of Tuberculosis for the Slums of Palembang City states that there is a relationship between the type of house walls and the incidence of pulmonary tuberculosis. There is a significant relationship between the walls of the house and the incidence of pulmonary tuberculosis because the valley walls and are not impermeable to water are the initial trigger for the disease transmission process [8].

House building materials that are not made of walls have a greater risk of the incidence of pulmonary tuberculosis. Because the house is made of non-wall building materials, the space in the house becomes hot, dusty, and becomes more humid. So that this high humidity will make a place for the development and growth of Mycobacterium tuberculosis bacterial cells. According to the Decree of the Minister of Health of the Republic of Indonesia No. 829/Menkes/SK/VII/1999, floor conditions that meet health requirements are those that are waterproof and easy to clean, such as the condition of floors made of plaster, tiles, cement, porcelain or ceramics. The construction of the floor of the house must be water tight and always dry and must be able to avoid rising soil which can cause increased humidity in the room. A humid room can be used as a place to live and breed bacteria and disease vectors.

Table 1 The relationship between house building materials and the incidence

Building Materials	Tuberculosis Incidence				Total	
	Cases		Control			
	N	%	N	%	N	%
Appropriate	6	30	12	60	18	45
Not Appropriate	14	70	8	40	22	55
Total	20	100	20	100	40	100
P-Value	0.111					
OR	3.500					
(95% CI)	(0.945-12.966)					

3.2. The relationship between home lighting and the incidence of pulmonary tuberculosis

The results of the research conducted on 40 respondents showed that there were 14 (35%) respondents with eligible house lighting and 26 (65%) respondents with house lighting that did not meet the requirements. This shows that the majority of respondents have home lighting that does not meet the requirements. The results of statistical tests obtained p-value = 0.002, it can be concluded that there is a significant relationship between the lighting of the house room with the incidence of pulmonary tuberculosis. From the results of the analysis, the value of OR = 13,500 (CI = 2,434 – 74,867) means that the lighting in the house is a risk factor for the incidence of pulmonary tuberculosis (Table 2).

The results of this study are in line with the research of Dawile [6]. The results of statistical analysis of natural lighting in the bedroom with the Chi-square test get a probability value (p-value) = 0.010 (<0.05), this means that there is a relationship between natural lighting and pulmonary tuberculosis. OR = 4,000 so that respondents with natural lighting < 60 lux (not eligible) are likely to have 4 times greater risk than respondents with natural lighting 60 lux (qualified).

According to the study, one of the variables influencing the lack of lighting in the respondent's home is a lack of vents or ventilation, as well as a lack of glass tiles. Unsuitable lighting conditions (60 lux) can create darkness and serve as an ideal environment for germ proliferation. This will also increase the number and concentration of germs, increasing the likelihood of disease transmission. Because a humid room is a breeding ground for disease vectors and germs, the building of the home floor must be tight and always dry against water and produce humidity. Tuberculosis can be avoided by installing a waterproof floor [9].

It is advisable for the health care center to provide counselling regarding the requirements for a healthy house that meets the requirements, especially lighting must meet the minimum requirements of 60 lux so that the lighting in the house is not less/dark and not dazzling. Lighting is also related to ventilation. The addition of ventilation can also affect lighting conditions.

Table 2 The relationship between home lighting and the incidence

Home Lighting	Tuberculosis Incidence				Total	
	Cases		Control			
	N	%	N	%	N	%
Appropriate	2	10	12	60	14	35
Not Appropriate	18	90	8	40	26	65
Total	20	100	20	100	40	100
P-Value	0.002					
OR	13.500					
(95% CI)	(2.434-74.867)					

3.3. The relationship between residential density and the incidence of pulmonary tuberculosis

The results of the research conducted on 40 respondents showed that there were 27 (67.5%) respondents with dense residential housing that met the requirements and 13 (32.5%) respondents with dense residential housing that did not meet the requirements. This shows that the majority of respondents have a dense residential house that meets the requirements. The results of statistical tests obtained a p-value = 0.501, so it can be concluded that there is no significant relationship between the density of housing and the incidence of pulmonary tuberculosis. From the results of the analysis, the value of OR = 0.500 (CI = 0.130 - 1.930) means that the density of housing is not a risk factor for the incidence of pulmonary tuberculosis.

This is not in line with the research conducted by Meilya Farika Indah, which stated that there was a significant relationship between the density of housing and the incidence of pulmonary tuberculosis. Meanwhile, in this study, there was no significant relationship between the density of housing and the incidence of pulmonary tuberculosis [10].

This is also not in line with the research of Muhammad Aandi Ihram (2013) which states that there was a significant relationship between housing density and the incidence of pulmonary tuberculosis. This is because the incidence of pulmonary tuberculosis is more experienced by respondents who have a residential density of 60% that does not meet the requirements. Meanwhile, pulmonary events were only experienced by respondents who had a housing density of 20% that met the requirements [11]. Housing density is commonly given in m^2 per person for the complete residence. The minimum per person is extremely relative; it is determined by the quality of the structure and its available services. Comparison of the number of inhabitants by the space of the room of the house occupied by the respondent inside the unit square meter (m^2), with the minimum requirement of 8 m^2/person [12].

Overcrowding will cause negative effects on health, both physical and mental health. The spread of infectious diseases, especially pulmonary tuberculosis in high-density homes, will quickly occur. So that every house must have a section of space that functions, determining the shape, size, and the number of rooms needs to pay attention to the minimum standard of the number of rooms. Because the house must have a room, namely a bedroom, living room, dining room, kitchen, and bathroom. The condition of the house shows a high relationship between bacterial colonies and occupancy density per square meter so that the effect created by the pollutant source has the potential to suppress immune reactions along with an increase in pathogenic bacteria with occupancy density in each family.

Table 3 The relationship between residential density and the incidence

Occupancy density	Tuberculosis Incidence				Total	
	Cases		Control			
	N	%	N	%	N	%
Appropriate	15	75	12	60	27	67.5
Not Appropriate	5	25	8	40	13	32.5
Total	20	100	20	100	40	100
P-Value	0.501					
OR	0.500					
(95% CI)	(0.130-1.930)					

4. CONCLUSION

According to the findings, there was no significant relationship between house building materials and the incidence of pulmonary tuberculosis, a significant relationship between home lighting and the incidence of pulmonary tuberculosis, and no significant relationship between the density of housing and the incidence of pulmonary tuberculosis. This serves as a resource for policymakers at Health Centre Banjarmangu 2 by identifying the state of the TBC environment.

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